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Special Section
Learning Without Frontiers 2011: Mobile Research Strand





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The Effects of Podcasting on College Student Achievement and Attitude

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Abstract

This mixed-methods study investigated the impact of weekly podcasts, written and recorded by course instructors to summarize college course content, on student achievement and attitudes. Weekly summative podcasts were posted on an Internet website in Windows Media format and downloaded by college students. After four weeks of podcasts, students were assessed and evaluated and results were compared to similar classes that did not use podcasts. Students completed a questionnaire and were interviewed to record their views, perceptions, and attitudes. Participating teachers were also interviewed. Although not generalizable, the results of this study indicate that weekly podcast summaries were an effective teaching tool which produced improved student achievement and caused students to view their evaluation preparation and comprehension of course content optimistically.

Keywords

Educational Technology; Podcasting; Learning

Introduction

The importance of student success is crucial in any educational endeavor and can be defined as the successful achievement of outcomes within a program of study. This inquiry attempted to realize two critical goals, namely enhanced achievement in college courses and increased student satisfaction with the academic delivery of information as evidenced by student attitudes. We believed that students could experience more success if college teachers were able to personalize curricula and deliver content in a manner that is contemporary, accepted, and gratifying. Therefore, we set out to use the mp3 player/iPod as a teaching enhancement tool within a college level program. We learned from a review of the literature that "video podcasting improves learner cognition . . . and improves learner efficiency . . ." (Mount & Chambers, 2008, p. 56). Similarly, we hoped to enhance learner cognition and learner efficiency for college level courses while boosting achievement outcomes. We believed this was possible if "students believed strongly that the podcasts increased teaching effectiveness" (Lyles, Robertson, Mangino, & Cox, 2007, p. 12). This "teaching effectiveness belief" held by students has been linked to educators who can personalize the learning environment by permitting students to learn in a milieu of their choosing and at their own comfort levels (Lynch, Downward, & Edirisingha, 2007).

The notion that teacher effectiveness can be improved via technology usage was both intriguing and motivating. In a study conducted by Edirisingha, Rizzi, Nie, and Rothwell, (2007) regarding podcast use to improve student learning and study skills, researchers demonstrated that “evidence from students who used podcasts clearly showed that they benefited from podcasts” (p. 99). Conceptually, we suggested that playing video or listening to audio as a means to enhance course content comprehension and student achievement was worthy of examination. Specifically, we theorized that podcast lesson summaries would be a useful tool to communicate content from teacher (sender) to student (receiver). Also, we speculated that college students might be more successful when teachers delivered course content in a manner that was both welcome and of interest to the students. This type of inquiry was not unique since the topic has been popular ever since the mp3 player was first introduced to the public.

For example, Mount and Chambers (2008) discovered that “video podcasting improves learner cognition through better integration of the visual and textual materials . . . [and it] improved learner efficiency through reduced information redundancy . . .” (p. 56). The authors also cautioned that, “podcasts should only be considered where clear evidence exists that students are equipped with the technology and hardware to benefit from them” (p. 56). Hence, ensuring students had access to computers on campus was key to the podcasting implementation within our inquiry.

Lyles et al. (2007) experimented with podcasting entire lectures, providing archive copies of lecture notes online and having a teacher use a tablet PC during class to display key academic details to see how it affected student attitudes in a first-year university class where each lecture was recorded, converted to podcast format, and posted for student access immediately after each class. Following course delivery in this manner, participants suggested, the podcasts increased teaching effectiveness, agreed that lecture podcasts enhanced the usefulness of archived lecture notes, disagreed that podcast availability made them less likely to attend class, and strongly agreed that availability of podcasts and archived notes helped them stay current when they missed class for legitimate reasons (p. 460).

Regarding the use of podcasts for enhanced academic delivery of course information, researchers Aliotta, Bates, Brunton, and Stevens (2008) explained that “podcasts should be targeted to the relevant course material, structured in a logical and engaging way and possibly incorporate visuals to concretize the concepts being discussed” (p. 42). Based on these recommendations the podcasts in this current study were specific to the course materials and used visuals to help explain the topics in question. Downward, Livingstone, Lynch, and Mount (2008) used podcasts to support fieldwork in the sciences by providing preparatory points and educational information during various stops in a field trip. Each podcast was no more than five minutes long and used an interactive ‘interview’ style as a means of keeping students engaged. Downward et al. (2008) concluded that their “experience demonstrates the flexible and adaptive nature of podcasting as a communicating and integrating tool that can be readily developed by staff and students” (p. 69). Also, Smith et al. (2007), in their research into the ability of podcasts to enhance student learning, discovered that “of the 52 students responding . . . 36 felt that each podcast should be 5 minutes or less in duration . . .” (p. 110). Similarly, the current study kept the podcasts relatively short.

Fothergill (2008) included details related to the use of podcasting in support of upper-year (i.e., second-year or later) students taking courses using an online delivery model. As each week passed in the online course, the instructor recorded podcasts that included the latest news relating the course material to current events, announcements, and feedback to help students stay on track, including clarifications of hard-to-understand topics and a ‘fun part’ where a joke would be included that related to the course in some fashion. Fothergill found that the podcasts produced for this course could equally have been published as text files on the announcement page of the course. However, as well as being more straightforward for the tutor to produce, it appears that the tailored audio track, reacting to the issues raised by the students and providing interesting background contextual information, was attractive to students by enlivening the course (p. 91).

An additional and important observation from Fothergill’s study was that the students liked podcasts because they could be played repeatedly, they could be paused and restarted, and students could jump to specific sections as needed. As a result, rather than prerecording the podcasts, we recorded at the end

of each week so that the content was timely and reflected actual events in the classroom. It should be mentioned that Fothergill's work was similar in many ways to our current investigation, but the demographic mix was different and the use of short, focused weekly summary reviews in our study was a different approach from that of Fothergill. Other researchers such as Evans (2007), Lee and Tynan (2008), Rosell-Aguilar (2007), and Sloan (2005) have provided compelling evidence that informed the current inquiry. Further support for this mode of instruction can be found within the work of researchers such as Copley (2007), Kaplan-Leiserson (2005), and Pilarski, Alan Johnstone, Pettepher, and Osheroff, (2008), who have indicated that podcasting can be a valuable tool for learning that needs to be further scrutinized.

Research Questions

We created the following series of questions based on the existing literature and to provide a framework for the current investigation:

1. Is there a difference in mean test scores between students who use weekly podcast summaries and students in previous classes (taught using the same course content and by the same teachers) who did not?
2. Do weekly podcast summaries improve student attitudes towards testing?
3. Do students view weekly podcast summaries as a useful tool for test preparation?
4. Do weekly podcast summaries improve student attitudes towards their course of study?
5. Do students view weekly podcast summaries as a replacement for attending class?
6. Do teachers view weekly podcast summaries as being helpful to student success?
7. Do students find weekly podcast summaries useful in helping them comprehend the topics they study?
8. Do students want more classes to adopt weekly podcast summaries?

Methods

Context

Our college is a small, government-funded institution located centrally in the province of Ontario, Canada, and enrolls approximately 3,000 full-time students in over 75 different diploma programs, with another 3,000 students attending part-time. Within this context, our mixed-methods design studied the effects of weekly lesson summaries in podcast format for students in three different courses in the Computer Systems Technician/Technologist program, the Office Administration program, and the Electrical Techniques program. Teachers in each program used a single class for this study, and the results were compared with students who took the same class in a previous year with the same teacher, content, resources (e.g., textbooks), and evaluation instruments. For a period of four consecutive weeks during the winter 2009 semester, and at the end of each week, teachers recorded a podcast of roughly five minutes in duration that either highlighted a particularly difficult topic or summarized the salient points of the previous week's lessons. Students were given access to these podcasts via a website. Podcasts could be run using any software that could play Windows Media format (wmv) files. This format was chosen because it was understood by current versions of the Microsoft Windows operating systems family, which was universally available at our school and in most homes for little or no cost.

Participants

There were two groups of heterogeneous participants, students and teachers in regularly scheduled classes. Participation was voluntary but encouraged with the explanation of the value of podcasting that previous research had highlighted. Five college teachers volunteered and after discussion of timelines and numbers of students we were left with a convenience sample of three classes to stage the investigation:

1. A first-year class in the Computer Systems Technician/Technologist (CST) program. Students were taught by us but the class we used for the research was taught by a different teacher. Of 17 students in the class, 13 volunteered and participated in the study. All students were male and 10 were 20 years of age or younger.
2. A first-year class in the Office Administration (OAD) program. Neither the students nor the teacher had any connections to us. Of the 23 students in this class, 13 initially volunteered to participate, but only 4 actively participated in the study. All participants were female, and 3 were 26 years of age or older.
3. A first-year class in the Electrical Techniques (ET) program. Neither the students nor the teacher had any connections to us. Of the 34 students in this class, 26 students initially volunteered to participate, and 12 actively participated in the study. All were male and 10 were 25 years of age or younger.

Procedures

A Panasonic Digital Video Camcorder, model PV-GS150, was used to record all podcasts that featured the teacher demonstrating a topic. A tripod was used to keep the camera steady and focused during classroom lecture simulations. When recording a podcast that demonstrated or explained a topic on a computer screen, the session was recorded using Microsoft Media Encoder 9, which recorded the actions on the computer as they happened.

In both cases, the recordings were converted into a Windows Media Player-compatible movie (wmv) format using Windows Moviemaker 6. The resulting movie was copied to a web server at the college. The website could only be reached by typing the proper URL in a web browser as there were no shortcut links to this portion of the website so that, as much as possible, only the subjects of this research would access the content, thus limiting any possible negative impact that might arise if too many people simultaneously accessed the website.

Recordings were made once a week for each of the three classes for a period of four weeks. The recordings outlined the salient points of each week's learning, thus acting as a summary lesson of the key points of that week's lessons. Each recording required about one hour of effort, from recording the original summary with the teacher to the conversion into wmv format and posting the finished podcast on the website. The podcasts remained on the website for the duration of our study.

All podcasts were made available for Internet download within 24 hours of being recorded. Each podcast could be played from home or at school on any computer that had Microsoft Windows Media Player installed (or any compatible media player such as RealPlayer). Students were provided with instructions and could ask for help to access the podcasts as needed. At the end of the four-week study module, participants were asked to fill out a questionnaire about their experiences with the podcasts, and were asked if they were willing to be interviewed to gain greater insight into how the podcasts affected them.

Each week, participants watched the podcast specific to their program online or downloaded it to their own computer or mp3 player for repeated viewing with or without Internet connectivity. If they chose to use a portable mp3 player, participants were responsible for converting the podcast from the Windows Media format into a format compatible with their mp3 players.

During and at the end of the four-week period, students were tested on the same course content (module) and using the same evaluation techniques that were used in the previous year. In addition, once the four-week period had passed, students were surveyed regarding their opinions regarding the effectiveness of podcasting. No information was collected that identified an individual participant, but demographic information such as age range, gender, and program was collected to compare and contrast the results in these subgroups. The questionnaires were administered during the regularly scheduled class time once the last podcasts had been used and the last tests involving the podcast topics had been given.

Participants were also asked in the post-study questionnaire if they would be willing to participate in an interview so we could discover more about their experiences. In addition, some participants were approached directly, in an attempt to create a representative sample that included both male and female participants, as well as people from all programs and ages.

Following the podcast intervention, student and teacher interviews were conducted. Those students involved in the interview process were asked a series of open-ended questions about their views on the use of podcasts in a weekly summary format and the impact these podcasts had on them. Their identities were protected through the use of pseudonyms and by recording audio-only during the interview, then transcribing the interviews onto paper and destroying the original audio. Interviews occurred in a private room with interviews scheduled in such a way that interviewees did not see any other interviewees, thus maintaining their anonymity. Interviews were voluntary, with each participant being invited as part of his/her questionnaire. Teachers were also asked to participate in a teacher-specific interview, following the same procedures as the student interviews.

For comparison purposes, grades of the 2009 (podcast-assisted) classes for any assessments that were affected by the podcasts were compared against the marks of the 2008 (no podcasts) classes. The overall results of the two classes were compared in an attempt to isolate whether differences in test scores were the result of within-group characteristics or the podcasts.

Qualitative & Quantitative Instruments

Overall, the assessments, for instance the chapter 5 and chapter 6 tests, were the exact same instruments delivered in the exact same fashion in both 2008 and 2009. The tests were administered from the official Cisco website, using the same set of test questions with the same time limit and using the same web interface. The only difference between the two academic years was the students, whose preliminary assessments were similar, so their respective capabilities at the start of the course were considered to be the same.

To collect quantitative data, we chose to use a questionnaire that opened with simple demographic questions (age, gender, and program of study) in order to conduct demographic comparisons. The questionnaire used a combination of practical questions about participants and their use of the podcasts and affective questions, using a fully anchored rating scale and a Likert scale to determine the attitudes of the participants towards the podcasts. The scale requires participants to respond to a series of statements by indicating whether they strongly agree (SA), agree (A), are undecided (U), disagree (D) or strongly disagree (SD) with each statement. Each response is associated with a point value, and an individual's score was determined by summing the point values of each statement. For example, the following point values are typically assigned to positive statements: SA = 5, A = 4, U = 3, D = 2, SD = 1. We included a neutral choice (neither agree nor disagree) because "if the neutral choice is not included and that is the way the respondent actually feels, then the respondent is forced either to make a choice that is incorrect or not to respond at all" (McMillan and Schumacher, 2001, p. 263). Some open-ended questions were included in the questionnaire as well.

Post-study interviews of students and teachers were composed entirely of open-ended questions and semi-structured questions. Because we used a mixed-mode research model, the use of these questions was appropriate. The use of interviews allowed us to collect information beyond what was provided by the questionnaires. We used a template of prepared questions as the basis of the interview but allowed the interview to stray as questions led to new discoveries. All interviews were transcribed and examined to uncover perspectives. Table 1 summarizes the questions for both the interviews and the questionnaires.

Table 1: Relationship between Research Questions and Questionnaire/Interview Questions

Research Question	Question Number from Student Questionnaire	Question Number from Student Interview	Question Number from Teacher Interview
Q2 – Improved attitude to tests	16, 17, 20, 23, 27, 28	4, 5, 6, 8, 12	
Q3 – useful for test prep	16, 17, 18, 19, 20, 23, 27, 28	4, 5, 6, 8, 12	
Q4 – improved attitude to course	16, 21, 22, 26, 28	4, 5, 6, 8, 12	
Q5 – podcasts not a replacement for class	10, 11, 28	6, 12	
Q6 – teachers see podcasts as helping students			3
Q7 –podcasts help with comprehension of topics	16, 18, 26, 28	4, 5, 6, 8, 12	
Q8 – students want more classes to use podcasts	18, 22, 26, 28	4, 6, 8, 10, 12	

Data Analysis

Once the data were collected they were aggregated using Microsoft Excel 2003. Both the quantitative and qualitative data were analyzed to determine the effects of the weekly summary podcasts on all participants. Specifically, the following analyses were performed:

1. Frequencies of participants by program, gender, and age group were calculated.
2. Responses to each question were analyzed using percentages, frequency distributions, and standard deviation to measure the spread of the scores.
3. Responses to each question were broken down by course (CST, OAD, or ET). After we examined these data, we determined that such a comparison was not valid due to low participation rates in both the ET and OAD classes, invalidating any possible cross-program comparisons.
4. Responses to each question were also broken down by gender. After we examined these data, we determined that such a comparison was not valid due to the low number of female students, invalidating any possible cross-gender comparisons.
5. Response to each question were broken down in two ways by age (18 and younger, 19-20, 21-25, 26-30, 31-40, and 41+; and 25 and younger, 26 and older). Once we examined these data, we determined that performing this comparison by age was of no value, as these groupings had too few participants.
6. Mortality rates of participants were studied (those who initially volunteered and those who actually used the podcasts) using raw numbers of participants.
7. Likert scale responses were analyzed to calculate what percentage of students either agreed or disagreed with various components of the podcast experience.
8. Comparison of average marks on tests influenced by podcasts versus average marks on the same tests without podcasts (previous course delivery, same teacher, same content, but different students), separated by program (ET, OAD, and CST). After we examined the data, we

determined that such a comparison was not possible for the ET and OAD classes due to low participation rates, so we restricted this comparison to the CST students only.

We also transcribed the interviews. In our context, the purpose was threefold: (1) We used the interviews to see if they supported or refuted the findings of the questionnaires; (2) We searched the interviews to find common themes related to the usefulness of weekly podcast summaries; and (3) We examined the interviews as a source of new insights into podcasting in a college environment.

For our purposes, the data from each interview were transcribed completely so we did not lose any 'nuggets of information' that lay therein. We also organized the data into groups. Cohen, Manion, and Morrison (2007) explained that these groups could be data-driven, i.e. "present all the data that are relevant to a particular issue", (p. 467); issue-driven, i.e. "organizing the analysis by research question" (p. 468); or people-driven when "organized by their membership of different strata in a stratified sample" (p. 467). In our study, we organized the quantitative data along gender lines, along course of study lines (ET, OAD, and CST), along student/teacher lines, and along age lines, all of which were driven by the people in the study. We also grouped both the quantitative and qualitative data by research question, so as we found information in an interview related to a specific question, we recorded it there, i.e. using an issue-driven approach. We also organized the qualitative data by issue in order to discover any new themes.

As we examined the interview data and compared the themes we uncovered against the conclusions drawn from the questionnaires and the research questions, we also looked for any unexpected themes to emerge. Those that neither supported nor refuted the conclusions of the questionnaires or had no relation to any research questions were gathered separately to help uncover new perspectives on podcasting and education.

The interview data were examined several times and as new themes arose from the data, classifications that may not have been identified before were added. As we made subsequent passes through the interview transcripts, we continually examined the data with an eye not just on the existing research questions, but also on the new themes that had emerged on previous passes. To identify the themes in the interview transcripts, the coding involved the use of printed copies of the transcripts, upon which we entered handwritten notes in the margins that explained the significance of each passage with respect to our questions or other themes that emerged during data analysis. As new themes emerged, the data were examined again to ensure that all transcripts were viewed in light of the new themes.

Once the data had been fully coded, we followed a process of enumeration (where feasible) to determine how frequent certain themes occurred in order to quantify some of our interview data. The negative case and discrepant data methods described by Gay and Airasian (2000) as "the search for data that are negative or discrepant from the main data collected in a study" (p. 243) was also used. As important as it was to find support for answer to the research questions, it was equally important to remember that research is an attempt to find new meanings or uncover new ideas, and "the search for negative and discrepant data provides an important counterbalance to the researcher's tendency to stick with first impressions or hunches" (p. 243).

In an attempt to find support for the findings within the questionnaire data, we utilized a method that Gay and Airasian (2000) referred to as triangulation. Thus, data collected by the questionnaires and interviews were examined together to find common themes that either supported or refuted the research questions. With a small sample size, tentative conclusions were drawn that are only applicable to the study population.

Findings

Demographics

A total of 3 teachers and 29 students actually used the podcasts, although 17 other students also filled out post-podcast feedback questionnaires. Student participants were distributed as Table 2 indicates.

Table 2: Distribution of Participants by Program and Gender, Including Mortality Rates

	Overall	CST	OAD	ET	Female	Male
Number of Participant Pre-Study Questionnaires (see Appendix A)	52	13	13	26	13	39
Number of Participants Post-Study Questionnaires (see Appendix B)	46	13	13	20	12	34
Mortality Rate	11.5%	0.0%	0.0%	23.1%	7.7%	12.8%
Number of Participants Who Actually Used Podcasts	29	13	4	12	4	25
Mortality Rate	44.2%	0.0%	69.2%	53.8%	69.2%	35.9%

According to Fraenkel and Wallen (2009), “for experimental and causal-comparative studies, we recommend a minimum of 30 individuals per group” (p. 102). Using this as a guide, the number of females who participated was too small to allow for gender-specific conclusions, and the number of participants who used the podcasts from the OAD and ET programs was also too small to support program-specific conclusions. The total number of participants who used the podcasts was 29, which was too few to allow generalizations to be made beyond the population in this study. Yet, as a mixed-methods research study, the qualitative and quantitative data collected did enable us to draw conclusions specific to the study population.

Achievement

Table 3 summarizes the performance of the 2008 and 2009 CST classes, specific to the class affected by the podcasts.

Table 3: CST Marks Comparison 2008 (No Podcasts; $n=9$) versus 2009 (Podcasts; $n=17$)

	Final Grade		Chapter 5 Test		Chapter 6 Test	
	2008	2009	2008	2009	2008	2009
Averages	73.5%	70.2%	64.6%	74.4%	61.4%	76.2%
Difference in Marks		-3.4%		9.7%		14.8%
S.D.	12.38	11.40	18.44	12.29	18.98	13.23
T-Tests (t) ($df = 24$)		-.69		1.42		2.32*
Effect Size (d)		-0.30		0.69		1.00

*significant at $p < .05$

In terms of final grades the 2008 class had a class average somewhat higher than the 2009 class. Specifically, the class average on the chapter 5 test was lower in 2008 than in 2009; the class average grade was 9.7% higher than the 2008 class. This strongly suggests that the podcasts had a positive effect on the 2009 class and their test results, as the podcasts were the only real difference in terms of classroom delivery. In terms of effect size, $-.30$ was viewed as small (21.3%), $.69$ medium (40% overlap) and 1.00 demonstrated the largest overlap of means at 55.4%.

Using the CST class as an indicator, we concluded that weekly podcast summaries may increase mean scores when compared against previous classes taught using the same course content and same teachers. Therefore, we answer research question 1 with a tentative “yes”, as it is plausible based on the results that were produced but unproven due to the small number of participants in this study.

Attitudes toward Podcasting

The first 9 questionnaire items related to demographic information, therefore we begin our data report at item 10. Questionnaire results are summarized in Table 4. As the table indicates, the sample was split on whether or not podcasts would affect classroom attendance. However, a majority of respondents stated that they do not see podcasts as a substitute for classroom attendance. Questions 12, 13, 14 and 15 were similar to other items covered hence they were omitted herein (see [Appendix B](#)).

Next, most students agreed that podcasts help students learn and study better (questions 16 and 17 respectively), and that their grades would improve if summary podcasts were available to them (question 18). Opinions were more divided as to whether podcasts are better than textbooks for studying (question 19), but students mostly agreed that podcasts are useful when preparing for tests (question 20).

With regards to more affective aspects, most students indicated that podcasts improved their attitudes toward class (question 21) and that they would be happier in other classes if those all had podcasts (question 22). When it comes to test anxiety, opinions were more divided (question 23).

Most students strongly disagreed or disagreed, while few students agreed or strongly agreed with the statement: “Instead of having weekly summaries, it would be better to have one large podcast at the end of the semester that summarized all important points for the semester” (question 24). Similar responses were collected for question 25, which gave students a choice between a course with weekly podcast reviews and one with a semester-length podcast review. However, students were divided when the choice had to be made between podcast reviews or in-class teacher reviews. Finally, most students indicated they felt better prepared for my tests when they used the weekly podcasts.

Table 4: Questionnaire Results (n=29)

Question	Yes	No	Not Sure		
10: Do you think that the availability of podcasts in all your classes could affect your classroom attendance?	12 (41.4%)	12 (41.4%)	5 (17.2%)		
11: Do you think that watching the podcasts could be a substitute for attending class?	5 (17.2%)	21 (72.4%)	3 (10.3%)		
Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
16. The podcasts helped me learn better.	0 (0.0%)	0 (0.0%)	6 (20.7%)	20 (69.0%)	3 (10.3%)
17. The podcasts helped me study better.	0 (0.0%)	0 (0.0%)	4 (13.8%)	21 (72.4%)	4 (13.8%)
18. Students would improve their marks if summary podcasts were available for their classes.	0 (0.0%)	0 (0.0%)	2 (6.9%)	18 (62.1%)	9 (31.0%)
19. Podcasts are better than textbooks for study purposes.	2 (6.9%)	1 (3.4%)	15 (51.7%)	7 (24.1%)	4 (13.8%)
20. The podcasts were useful when preparing for my tests.	0 (0.0%)	2 (6.9%)	1 (3.4%)	19 (65.5%)	7 (24.1%)
21. Having weekly podcast summaries improved my attitude towards this class.	0 (0.0%)	3 (10.3%)	10 (34.5%)	12 (41.4%)	4 (13.8%)
22. I would be happier in my other classes if they also had weekly podcast summaries.	0 (0.0%)	0 (0.0%)	5 (17.2%)	16 (55.2%)	8 (27.6%)
23: Studying using the podcasts made me feel less anxious or nervous going into my tests.	0 (0.0%)	7 (24.1%)	9 (31.0%)	11 (37.9%)	2 (6.9%)
24. Instead of having weekly summaries, it would be better to have one large podcast at the end of the semester that summarized all important points for the semester.	9 (31.0%)	6 (20.7%)	8 (27.6%)	2 (6.9%)	4 (13.8%)
25. If there were 2 sections of the same class and one section offered weekly podcasts while the other offered a single longer podcast at the end of the semester that reviewed the entire semester, I would prefer to be in the class with the single semester-long podcast.	11 (37.9%)	11 (37.9%)	4 (13.8%)	0 (0.0%)	3 (10.3%)
26. If there were 2 sections of the same class and one section offered weekly podcasts while the other offered in-class review sessions with my teacher, I would prefer to be in the class with the podcasts.	1 (3.4%)	9 (31.0%)	7 (24.1%)	7 (24.1%)	5 (17.2%)
27. I felt better prepared for my tests because I used the weekly podcasts.	0 (0.0%)	2 (6.9%)	7 (24.1%)	16 (55.2%)	4 (13.8%)

Discussion

Our research essentially asked: Are podcasts designed to summarize the salient points from a week of learning and are they useful in improving fact retention, topic comprehension, and attitudes towards learning amongst college students? Using a combination of questionnaires to gather quantitative data and interviews to gather personal perspectives, we collected data to find out how both teachers and students felt about the use of weekly summary podcasts as a review tool. The interviews followed a script but, as answers led to more questions, there were times where the interviews were less rigid, open-ended, and free flowing as the participants took the interviews to new places outside the interview script. This was the plan from the start, as a semi-structured interview allowed for the collection of more and different data than a survey instrument, and this flexibility enabled the interviewer to explore ideas that may not otherwise have been examined.

The students in our study found benefits in the use of weekly summary podcasts, both in terms of their impressions of the values of the podcasts and in terms of their grades. The excitement noted and observed indicated that students and teachers strongly supported the use of these podcasts as an effective learning tool at the college level. In addition, test grades tended to be higher for students who used the podcasts (research question 1).

While the 'weaker' students, whose final grades were lower, showed the greatest improvement in their marks on the podcast-affected tests, all students voiced the opinion that the podcasts were useful and helped them in their studies (research question 7). Based on interview feedback, this improvement was likely due to the ability to repeatedly play back lesson materials. Also, this process may have assisted visually-oriented learners or students with learning difficulties, such as dyslexia, or who experience other problems using written materials such as books and text-based websites.

Students in the study found the weekly podcast summaries useful when preparing for tests (research question 3). A number of students specifically mentioned that the podcasts supported their personal learning styles, which explains why they found them helpful in test preparation. Also, the ability to play the podcasts wherever and whenever they liked allowed students to study at a time and location of their choosing, i.e. when they were most ready to study.

Additionally, students in our study wanted more classes to incorporate weekly podcast summaries in course delivery (question 8). This finding is a side effect of the other findings. Since the students found podcasts useful in the classes from the study; they obviously wanted them in their other classes also.

Teachers in the study believed the weekly podcast summaries helped the students improve their comprehension and achieve better marks (research question 6). The marks in the two podcast-affected tests were evidence that helped the teachers reach this conclusion. They also found students were looking forward to the podcasts and were disappointed when the study ended.

Surprisingly, teachers also found that preparing for the podcasts helped them prepare for classroom delivery and the dollar cost to do this was minimal. Although the study was originally designed to examine how podcasts would affect students, it was interesting to see that teachers also found that they derived benefits from preparing their podcasts each week. They believed the podcasts helped them be more organized in their approach and helped them create better lessons.

Interestingly, but not unexpectedly, this study also provided support for earlier studies. For instance, the students in this study enjoyed the flexibility that podcasts provided in terms of the 'when, where, and how' of student access, which supports the work of Lee and Tynan (2008), whose students "perceived listening as a learning task best performed within a designated study location, usually at home" (p. 97). Lyles et al. (2007) added that students found "podcasts made it easier for me to tackle the material after class" (p. 460).

Next, students in this study did not really find mp3 players handy, as opposed to downloading the podcasts on their home computers, which supported earlier findings of Lee and Tynan (2008), who stated that students “found it cumbersome to transfer the podcasts to portable players” (p. 97). Having said that, if we had made a pronounced effort to publish the podcasts through a subscription service (e.g., iTunes or RSS), more students may have used their mp3 players, as one of the students indicated this may have been of interest. This is an area for future research.

As stated before, some of the interviews showed that the podcasts supported students with different learning styles. This supports previous findings by Rosell-Aguilar (2007), who stated how “hearing has a number of advantages, which include being instinctual... gets around issues such as illiteracy and dyslexia... and listening and learning go hand in hand” (p. 480). Sloan (2005) suggested podcasting helps “students with reading and/or learning disabilities” and assists “remediation of slower learners” (slide 12). Students enjoyed the ability to play the podcasts repeatedly, to pause them and to rewind them for review purposes, which supports the work of Fothergill (2008), who found that his subjects enjoyed being able to play parts repeatedly, pause, rewind, and jump to specific sections as needed. The students interviewed by Lyles et al. (2007) stated that “podcasts also allowed me to stop and replay any sections I found particularly difficult” (p. 460).

Participants in the study found that podcasts improved both their results and their feelings (attitudes) about their learning (research question 4). This supports the work of Mount and Chambers (2008) who found that “podcasting improves learner cognition” (p. 56). Lyles’ et al. (2007) study participants said things such as “the availability of the audio podcasts and lecture notes fit my personal learning style” (p. 461) and “I was able to process the information without feeling rushed like I would have if I was in the classroom” (p. 460). These comments were very similar to comments received from the students in this inquiry.

Students felt better prepared for tests when they used the podcasts and the podcasts helped the students become more focused on their review for tests (research question 2). This supports the findings of Lee and Tynan (2008), who had one student who said: “I used to spend more time reading and wasting time figuring out the key areas of the subjects when I really needed someone to give me an overview to put all the reading in context” (p. 100). The fact that the podcasts were focused on the most important points from a week of learning certainly helped the students focus their study efforts on these critical points.

Participants also expressed a number of new ideas, many of which would make worthwhile areas for future research. One student proposed that we should use the podcasts for classroom reminders or announcements (e.g., when the next test will be, how tests will be evaluated, what format a future test will use, etc.). This format could be used to support classroom notes, as some students are not good note-takers. Another idea for research came from a student who indicated that he would like to use the podcasts in a similar fashion for class assignments, where answers could be demonstrated in podcast format instead of just handing back a paper with a grade on it. Some students also suggested that we should provide more detailed review podcasts that covered more material. There has been some research into this model already, but perhaps a hybrid model of weekly short summaries combined with longer midterm or final exam summaries could be explored.

For our young, technologically savvy students podcasts may have improved attitudes towards their studies, and the use of podcasts may have helped them ease into tests when they used podcasts to prepare. In addition, the teachers in the study viewed weekly podcast summaries as being helpful to student success, but a new study involving more teachers is needed for this conclusion to be generalizable. Also, it remained unclear whether students viewed weekly podcasts as a replacement for attending regular classes (research question 5), as there was a split in opinion on this topic amongst the participants. These are all areas where more research is needed.

Limitations

There were some limitations and problems. Mortality, especially amongst female students, played a large role in limiting our ability to draw conclusions that could apply to a wider audience. Future studies will need to attend to four themes that emerged from students who failed to use the podcasts and dropped out: (a) I Forgot; (b) Skills Shortage; (c) Lack of Time; and (d) Saw No Need. It is important, especially in the early stages of research, that the research team puts in additional effort to ensure students know how to use the podcasts and that they recognize and understand the values they can gain from using them. A friendly reminder each week when the podcasts are available would be useful. It is also important to remind participants of the minimal time commitment and the potential value of the podcasts to increase their achievement.

It also would have been interesting to draw conclusions about any differences between students based on area of study, age, and gender. Our small sample size prevented any conclusive (quantitative) answers in this regard. Therefore, we recommend that future research investigate similar populations with significantly large samples.

Although all teachers in the study were supporters of podcasting once they had had the experience of using them for their classes, they all saw the value for their students, and they discovered unexpected benefits in their teaching, there was also an underlying concern expressed about the possible workload that podcasts could cause for teachers in their course development. Additional research is needed in order to more fully engage teachers and uncover how the use of weekly podcasts could affect their work.

Finally, one of the questions not answered to our satisfaction was the question of whether students would view weekly podcast summaries as a replacement for attending class (research question 5). This is a question that could have great importance on student learning in the future and will impact the instructional prompts given to students at beginning of a research study regarding that nature and purpose of the podcasts. Our experience as educators suggests that there is a direct link between classroom attendance and achievement. If podcasts were used as a classroom replacement, such practice could lead to lower student achievement, and therefore we recommend more research into this question to be conducted.

Implications and Conclusions

With respect to the implications for teaching, we firmly believe that we need to get more tools, like podcasts, into our curriculum, specifically as it relates to adult learners. As the student populations in our schools change, our methods must also evolve to suit such change. Students in this study appreciated technology in their everyday lives and their immediate adoption of the podcasts as a useful tool in their learning demonstrated one way in which we can use technology to help college students learn. The time commitment for the teachers was minimal and students valued the benefits, both real and perceived. This led to improved test scores and changed attitudes.

Finally, the following conclusions can be drawn concerning weekly podcast summaries as they affected the participants in this study:

1. Mean test scores for students who used podcasts were higher than for those who did not.
2. Students found the weekly podcast summaries useful when preparing for tests.
3. Teachers believed the weekly podcast summaries helped students improve their comprehension and achieve better marks (test scores).
4. Students found weekly podcast summaries improved their comprehension of the topics covered by the podcasts.
5. Students wanted more classes to incorporate weekly podcast summaries in the course delivery.

6. Students enjoyed the flexibility of 'anytime/anyplace' access to the podcasts, so they could study at a time and location of their choosing.
7. Students liked being able to rewind/replay podcasts as many times as necessary, so they could take notes at their own pace and learn at their own pace.
8. Students believed the podcast summaries improved their score (achievement).
9. Teachers found that preparing for the podcasts helped them prepare for classroom instruction.

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